VUCS13001 : ADVANCED R

Hours: 30

Course Objectives:

- To acquaint students with advanced concepts in Statistics using R.
- To introduce elementary and advanced statistical methods of data analysis using R.

Course Outcomes:

After successful completion of this course, the student will be able to:

- construct various diagram using qualitative and quantitative data.
- calibrate correlation and regression statistical analysis.
- Perform one-way and two-way ANOVA table.
- Integrating data mining techniques.

Unit I: Descriptive and Bivariate Statistical Analysis **10 hrs**

Introduction; Graphics with R-Diagrammatic representation of data; Graphical representation of data; Histograms, Barplots, Boxplots; Measures of central tendency- frequency distribution for a discrete variable, frequency distribution for a continuous variable; Measures of skewness- Karl Pearson's measure, Bowley's measure; Correlation; Scatterplots; Regression-Linear regression models.

Unit II: Probability and Inference in R **10 hrs**

Probability in R – Distributions, Maximum Likelihood Estimation, Hypothesis Tests in R, Proportion Test, Testing a Mean, Test for the Median, Two Sample t-Test, Paired Differnces, Distribution of a Sample Mean, Sampling Distributions, Simulating Sampling Distributions, Confidence Intervals, Hypothesis Testsing.

Unit III: Analysis of variance & Data Mining **10 hrs**

One-Way ANOVA, Two-Way ANOVA, Decision Trees, Dendogram, Logistic Regression, Clustering-The K-Means Clustering, The k-Medoids Clustering, Outlier Deduction, Time Series Analysis – Forecasting.

Reference:

Yanchang Zhao, (2012). *R and Data Mining: Examples and Case Studies.* Published by Elsevier.

Jay Kerns. G, (2010). *Introduction to Probability and Statistics using R.*

Hothorn, Torsten and Brian Everitt. S. (2014). *Handbook of Statistical Analyses Using R*, (3rd ed.), CRC Press.

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VUCS13002: eSketch PRO

Hours: 30

Course Objective:

- To make the students to understand and learn to design the frequency-shaping analog circuits.
- To introduce various skills needed to changes in layout, component values, component tolerances and op amp Gain Bandwidth.

Course Outcomes:

After successful completion of the course, the student will be able to:

- Understand the various aspects of file merging and conduction of analog simulation circuits.

Unit 1: Schematica capture: **10hrs**

File merging - importing of (registered) Filter Wiz PRO files-rapid component (device) placement Fast editing of component values - op amp device database provides Gain Bandwidth values for over 600 op amps - full circuit editing capabilities such as copy, cut and paste - annotation with text boxes and markers

Unit 2: Analog circuit simulation: **10hrs**

Automatic indication of when circuit is ready to simulate - view two graphs simultaneously -two voltage probes - view both, either, or difference - save previous traces to view up to 13 voltages or currents at once - amplitude response (real, imaginary, dB, volts) - phase and group delay responses - input impedance - component current, impedance and power dissipation - Sensitivity of output voltage to changes in component values - Transient response to impulse, step and "staircase" inputs - "ideal" and "real" op amp models - Monte Carlo analysis - Parameter Sweep analysis - Pole-zero placement

Unit 3: Analog Circuit simulation Experiments **10hrs**

Inverting and Non inverting Amplifier - Low pass and High pass filter - Band pass filter - RC Phase shift Oscillator.

References:

Sketchbook PRO 2015: perspective sketching tools Microelectronic Circuits (6th Edition) - Adel S Sedra & Kenneth Carless Smith: Oxford University Press

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VUCS13003: SOFTWARE TESTING

Hours: 30

Course Objective:

- To provide knowledge in basic concepts of software testing.

Course Outcomes:

After successful completion of the course, the student will be able to:

- analyze software testing approaches, testing fundamentals, characteristics of testing and STLC
- compare black box testing, white box testing, unit testing, performance testing, security testing and UI testing
- develop test specification, test execution and software testing report

Unit 1: Introduction **5 hrs**

Definition of Software Testing, Need for software Testing, various approaches to Software Testing, defect distribution, Software Testing Fundamentals. General characteristics of testing, seven principles of testing.

Unit 2: Process of Testing **5 hrs**

Software Testing Life Cycle - Deliverables of Each Phase of STLC - Test Plan - cost-benefit analysis of testing, Test organization, Test strategies

Unit 3: Types of Testing **7 hrs**

Black Box Testing - White Box Testing – Unit Test – Boundary Value Analysis Test - Functional testing concepts, Equivalence class partitioning, Boundary value analysis, Decision tables - UI Test - Performance Testing - Security Testing

Unit 4: Test Case Selection and Adequacy, Test Execution **5 hrs**

Overview; Test specification and cases; Adequacy criteria; Comparing criteria; Overview of test execution; From test case specification to test case

Unit 5: Software Testing Report **8 hrs**

Access Project Management Development Estimate and status, Requirement Phase Testing, Design Phase Testing Program, Phase Testing, Execute Test and record results, Acceptance Test Report Test results, Testing Software Installation, Test Software Change, Evaluate Test Effectiveness. Testing calculating model(TCM)

References:

Glenford J.Myers, Corey Sandler, Tom Badgett, *The Art of Software Testing, (3rd Edition)*, Wiley –India Edition.

Paul C. Jorgensen, *Software Testing – A Craftsman's Approach, (4th Edition),* CRC Press.

Ron Patton, *Software Testing, (2nd Edition)*, Sams.

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VUCS14001: PROJECT DEVELOPMENT TOOLS

Hours: 30

Course Objective:

To provide the knowledge in the tools for developing the project.

Course Outcomes:

On the successful completion of the course the student should be able:

- to create a professional business document
- to develop and display the web content

Unit 1: MS Word **6 hrs**

Introduction to MS Word; Basic Editing: Editing features; Formatting: Paragraph formatting, page formatting; copying and moving text and object; Tables; Links; Mailing; Inserting graphics, pictures, table of contents; Views: document views, macros.

Unit 2: MS PowerPoint **6 hrs**

Introduction to MS Power Point: Creating a basic presentation; Building blocks of presentation; Working with text, links, themes, styles, charts, graphs and tables, media clips and animation; Illustrations; Themes; Macros and Customizing power point

Unit 3: Introduction to JOOMLA **6 hrs**

Introduction to Joomla; Joomla Versions; Concepts of Joomla; Menus, articles, sections, categories; Modules, components and plugins; Global configuration; Article manager; Section manager

Unit 4: Styles and Templates **6 hrs**

Category manager; Front page manager; Menu manager; Default Joomla templates; Customizing the Joomla templates; Adding styles to Joomla templates; Media manager; User manager

Unit 5: Joomla Frontend **6 hrs**

Linking CSS, Javascript - Displaying content in HTML – Creating Custom Forms – Form Appearance using CSS.

References:

Cory Webb, *Beginning Joomla Web Site Development*, Wrox Wiley 2009.

Ron Severdia and Kenneth Crowder, *Using Joomla*, O'Reilly, 2010.

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VUCS15002: PL/SQL WITH DATABASE CONNECTIVITY

Hours: 30

Course Objective:

- To inculcate knowledge in PL/SQL & Database Connectivity.

Course Outcomes:

On successful completion of the course, the students should be able to

- explain the concepts of SQL Environment and DDL Commands
- illustrate data retrieval with PL/SQL Commands
- develop PL/SQL triggers, cursors and functions

Unit 1: Introduction to SQL **5 hrs**

SQL Environment – SQL – Logging into SQL - SQL Commands – Errors & Help – Oracle Tables: DDL: Naming Rules and conventions – Data Types – Constraints – Creating Oracle Table – Displaying Table Information – Altering an Existing Table – Dropping, Renaming, Truncating Table – Table Types – Spooling – Error codes.

Unit 2: Working with Table **6 hrs**

DML – adding a new Row/Record – Customized Prompts – Updating and Deleting an Existing Rows/Records – retrieving Data from Table – Arithmetic Operations – restricting Data with WHERE clause – Sorting – DEFINE command – CASE structure. Functions and Grouping: Built-in functions – Grouping Data - Join – Set operations.

Unit 3: PL/SQL - A Programming Language **7 hrs**

History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Declaration – Assignment operation – Bind variables – Substitution Variables – Printing – Arithmetic Operators. Control Structures and Embedded SQL: Control Structures – Nested Blocks – SQ L in PL/SQL – Data Manipulation –Transaction Control statements.

Unit 4: PL/SQL Cursors and Exceptions **7 hrs**

Cursors – Implicit and Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE – WHERE CURRENT OF clause – Cursor with Parameters – Cursor Variables – Exceptions – Types of Exceptions.

Unit 5: PL/SQL Composite Data Types **5 hrs**

Records – Tables – Varrays. Named Blocks: Procedures – Functions – Packages –Triggers – Data Dictionary Views.

References:

Dr.P.S.Deshpande, *SQL & PL/SQL for Oracle 11g Black Book*, dreamtech

Steven Feuerstein, Bill Pribyl, *Oracle PL/SQL Programming, (6th Edition)*

Steven Feuerstein, *Oracle PL/SQL Best Practices,* (2nd Edition), O'Reilly

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VUCS15004 : INTRODUCTION TO XML

Hours: 30

Course Objective:

- To teach the basics involved in publishing content on the World Wide Web.

Course Outcomes:

After successful completion of the course, the student will be able to:

- analyze the elements and attributes of a web page
- develop web pages with HTML, XML and XML Object Model

Unit 1: Introduction to HTML **5 hrs**

What is HTML - HTML Documents - Basic structure of an HTML document - Creating an HTML document - Mark up Tags - Heading-Paragraphs - Line Breaks - HTML Tags.

Unit 2: HTML Elements **6 hrs**

Introduction to elements of HTML - Working with Text - Working with Lists, Tables and Frames - Working with Hyperlinks, Images and Multimedia - Working with Forms and controls.

Unit 3: Introduction to XML **7 hrs**

The Need for XML - Structured Data and Formatting - Advantages of XML and HTML, XML Applications and Tools, Creating and Viewing XML Documents, XML Document Syntax, Validating XML Documents with DTDs

Unit 4: XML Entities and Attributes **7 hrs**

XML essentials - Entities and attributes - Cascade Style Sheets - XML Scheme - Handling XML Documents and Data Binding - XML Namespaces.

Unit 5: XML Object Model **5 hrs**

XML DOM - XSL Transformations - XSL Formatting Objects - XML and ASP- XML and Servlets - XML and Perl- WML

References:

Thomas Powell, *HTML & CSS: The Complete Reference,* (5th Edition), McGraw Hill Education.

Williamson, (2001), *XML: The Complete Reference*, McGraw Hill Education.

Mike Mcgrath, *XML in easy steps,* McGraw Hill Education.

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VPCS13001: .NET

Hours: 30

Course Objectives:

- To learn the ability to effectively use visual studio .NET.
- To understand objectives of the .NET Framework.

Course Outcomes:

After completion of this course, the student will be able to:

- understand .NET Framework and describe some of the major enhancements to the new version of Visual Basic.
- describe the basic structure of a Visual Basic.NET project and use main features of the integrated development environment (IDE).

Unit I: .Net Framework **8 hrs**

Introduction to .NET Framework; Component of .NET – CLR and Library; Introduction to Visual Stdio.NET **C#:** C# Language elements ; Object oriented programming with C# , Encapsulation, Inheritance, Polymorphism; Properties and indexers ; Automatically implemented properties; Interfaces, Structures, Enumeration; Assemblies, Namespaces and Access specifiers; Partial classes; Partial methods; Exception Handling; Operator overloading; Conversion operators; Extension methods; Delegates; Lamda expressions; Events; Generic classes and methods; Dynamic lookup; Multithreading; Creating Attributes

Unit II: VB.Net Language **8 hrs**

Origin of VB.NET; Language elements of VB.NET; OOP with VB.Net; Windows Applications: Introduction to windows application; Using Textbox, Button, CheckBox, RadioButtons; Using ComboBox, GroupBox etc.; Event handling; Handling mouse and keyboard events; Using menus and multiple windows.

Unit III: .Net Library **6 hrs**

Standard types such as Object, String, StringBuilder, DateTime etc; IO Streams – Stream, FileStream, StreamReader, File, Directory etc.; Serialization of Objects; Collection Classes – ArrayList, HashTable etc; Generic based collections – List, Dictionary; Network classes – TCPListener; Reflection – Type, Assembly etc.

Unit IV: VB.Net with Database **8 hrs**

Reading from database,Understanding database, creating database, creating a data page and display in datagrid, ADO.NET connectivity using oleDb connection object, oleDb command object, dataset & datareader; Advanced data handling,Updating databases, adding, editing, deleting objects, auto generated commands; Creating master pages,What is master & content page, how to connect a master to a content page with an example; Reporting,Generating a report using crystal report viewer by using crystal report source.

References:

Christian Nagel et al. "*Professional C# 2005 with .NET 3.0*", Wiley India, 2007.

Andrew Troelson, "*Pro C# with .NET 3.0*", Apress, 2007.

Kevin Hoffman, "*Visual C# 2005*", Pearson Education, 2006.

S. Thamarai Selvi, R. Murugesan, "*A Text Book on C#*", Pearson Education, 2003.

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VPCS13002: LIFE SKILLS FOR COMPUTER PROFESSIONALS

Hours: 30

Course Objectives:

- To explore the vital resources of life.
- To get focused with a definite purpose in life and create a compelling future with clearly defined goals.
- To break limiting patterns of thoughts, beliefs, behaviour and habits.
- To develop personal and interpersonal effectiveness.

Course Outcomes:

After successful completion of the course, the student will be able to:

- apply a techniques of problem solving to overcome life's challenges.
- recognise life values to integrate professional and personal life.
- create a compelling future with clarity defined goals .

Unit 1: Mastering Emotions: **6 hrs**

Significance of mastering emotions, reactive and proactive people, ways to deal with emotions, avoiding inner conflicts, analysis of inner traits and negative traits, creating long- term changes.

Unit 2: Life Values **6 hrs**

Types of life values- personal values, social values, professional values, spiritual values; Life Vision, beliefs and values, Life goals - personal development goals, family goals, educational goals, career goals, financial, material goals and social goals.

Unit 3: Effective Communication **6 hrs**

Types of Communications - Verbal communication, Non- verbal communication, activities related to communications Presentation skills, listening skills. Activities based on Types of talk to get action, to inform, to convince

Unit 4: Problem solving **6 hrs**

Defining problems, potential cause of problems, identification of possible solutions, finding the best solution and decision-making.

Unit 5: Successful Relationship **6 hrs**

Principles of successful relationship: Ways to make impressive relationship, Methods to make people to like us, think in our way, bringing people to around you, ways to overcome worry and find peace and happiness.

References:

Covey, S. R., & Covey, S. (2020). *The 7 habits of highly effective people*. Simon & Schuster.

Covey, S. R., Merrill, A. R., & Merrill, R. R. (1995). *First things first*. Simon and Schuster.

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VPCS14001: DATABASE ADMINISTRATION

Hours: 30

Course Objectives:

- To provide Oracle professionals with an in-depth understanding of the DBA features of Oracle, specific Oracle concepts and knowledge required for the OCP & DBA exam.
- To gain insights on the database architecture, including memory, process and data structures, and the management of those structures.

Course Outcomes:

After completing this course, the student will be able to:

- demonstrate the use of Oracle Management Environment.
- adopt the Enterprise manager, structure, tablespace and roles in the database instance.

Unit 1: Fundamental of SQL **4 hrs**

Retrieving data using the SQL select statement, Restricting and sorting data, using single row function to customize output. Reporting aggregated data using the grout function, Manipulating data, using DDL statements to create and manage tables.

Unit 2: Introduction to DBA **10 hrs**

Oracle Database Architecture, Tablespace and Data files, managing the Oracle Instance: management framework, Staring and stopping Database Control, Oracle Enterprise manager, Accessing oracle enterprise manager, STARTUP an oracle database Instance, NOMOUNT, MOUNT, OPEN, SHUTDOWN an Oracle database Instance

Unit 3: Managing and Storage Structure **4 hrs**

Managing Database Storage Structure , Storage Structures, How table Database is stored, Creating a New Tablespace, Storage for Locally managed Tablespace, Tablespace in the Preconfigured Database.

Unit 4: Administering User security **6 hrs**

Database User Accounts, Authenticating a user, Administrator of user ,unlocking a user and rest a password, Privileges, Role: Creating a role, Assigning role to the user, Profiles and user, creating a Password profile, supplied password verification function. Assign quota to user

Unit 5: Managing undo Data **6 hrs**

Data manipulation, undo Data, Transactions and undo Data, Storing undo Information, Undo vs Redo data, monitoring undo. Administering Undo. Configuring the Oracle Network Environment.

References:

Bob Bryla, Kevin Loney (2013). *Oracle Database 12c: The Complete Reference*. McGraw Hill Education

Ravinder Gupta (2016). *Mastering Oracle Golden Gate 1st ed. Edition.* Apress; 1st ed. Edition

Sims, A. C. (2010). *Oracle Database 11g-Underground Advice for Database Administrators*. Packt Publishing Ltd.

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VLSC13001: ANIMAL TISSUE CULTURE

Hours: 30

Course Objectives:

- To provide knowledge on history and techniques in animal cell culture.
- To understand the study of biochemical and physiological processes of the cell using various cell lines.
- To comprehend the basic information about the conditions of cell culture, cell line maintenance, passage and using of cell culture and tissues

Course outcomes:

After successful completion of the course, the student will be able to:

- Learn the essential laboratory technique on animal cell culture.
- Understand the knowledge on conditions of cell culture, cell passaging and cell viability assay and cryopreservation.

Unit 1: Introduction of Animal tissue Culture and Media preparation **8 hrs**

Introduction, history and scope of Animal Biotechnology; terminologies in animal cell culture; Media constituents, physiochemical properties of a media, types of animal cell culture media: natural–plasma clot, biological fluids, tissue & embryo extracts. Importance of serum in media, artificial–chemically defined media, choice of medium and serum.

Unit 2: Cell lines and Culturing techniques **8 hrs**

Isolation of tissue, Primary culture: disaggregation of tissue–enzymatic, mechanical, and primary explant technique; Secondary cultures– transformed cells and continuous cell lines; Cell lines and cloning.

Unit 3: Applications of Animal Cell Culture **8 hrs**

Cancer Research, vaccine manufacture, gene and stem cell therapy, production of recombinant proteins, IVF Technology, toxicology studies.

Unit 4: Translational Research Applications **6 hrs**

Rodent and murine models in scientific research associated with cancer and neurodegenerative diseases. Animal cells as the applicable products (recombinants, hybridomas, stem cells and transplants).

References:

Freshney, R.I. (2010). *Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications*. Wiley-Blackwell, 2010. 6th Edition.

Davis, J. M. (2008). *Basic Cell Culture*. Oxford University Press, New Delhi.

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VLSC13002 : LIFE SKILLS FOR LIFE SCIENCE PROFESSIONALS

Hours: 30

Course Objectives:

- To develop communication competence in students and to enable them in conveying thoughts and ideas with clarity and focus with good writing skills.
- To equip them to face interview & Group Discussion.
- To inculcate critical thinking process and to prepare them on problem solving skills.

Course Outcomes:

After successful completion of the course, the student will be able to:

- Provide symbolic, verbal, and graphical interpretations of statements in a problem description.
- Understand team dynamics & effectiveness.
- Instill Moral and Social Values, Loyalty and also to learn to appreciate the rights of others.
- Learn leadership qualities and practice them.

Unit 1: Writing and Reporting Skills **6 hrs**

Technical Writing: Differences between technical and literary style, Elements of style; Common Errors, Letter Writing: Formal, informal and demi-official letters; business letters, Job Application: Cover letter, Differences between bio-data, CV and Resume, Report Writing: Basics of Report Writing; Structure of a report; Types of reports.

Unit 2: Communication and Presentation Skills **8 hrs**

Interview Skills: Types of Interviews; Ensuring success in job interviews; Appropriate use of non-verbal communication, Group Discussion: Differences between group discussion and debate; Ensuring success in group discussions, Presentation Skills: Oral presentation and public speaking skills; business presentations, Technology-based Communication: Netiquettes: effective e-mail messages; power-point presentation; enhancing editing skills using computer software.

Unit 3: Group Problem Solving, Achieving Group Consensus **8 hrs**

Steps in problem solving, Problem Solving Techniques, Problem Solving through Six Thinking Hats, Mind Mapping, Forced Connections. Problem Solving strategies. Group Dynamics techniques, Group vs Team, Team Dynamics, Teams for enhancing productivity, Building & Managing Successful Virtual Teams. Managing Team Performance & Managing Conflict in Teams. Working Together in Teams, Team Decision-Making, Team Culture & Power, Team Leader Development.

Unit 4: Morals, Values and Ethics **8hrs**

Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for Others, Living Peacefully. Caring, Sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence, Character Spirituality, Senses of 'Engineering Ethics', variety of moral issued, Types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, Consensus and controversy, Models of Professional Roles, Theories about right action, Self-interest, customs and religion, application of ethical theories.

References:

Life Skills for Engineers, Complied by ICT Academy of Kerala, McGraw Hill Education(India) Private Ltd., 2016.

Barun K. Mitra; (2011), "*Personality Development & Soft Skills*", First Edition; Oxford Publishers.

Larry James (2016); "*The First Book of Life Skills*"; 1st Edition; Embassy Books.

Shalini Verma (2014); "*Development of Life Skills and Professional Practice*"; 1st Edition;Sultan Chand (G/L) & Company.

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VLSC14002: RESEARCH METHODOLOGY

Hours: 30

Course Objective:

- To give knowledge and understanding of the essentials of research
- To comprehend on interpretation and research writing

Course Outcomes:

After completing the course students will be able to:

- learn about designing of experiments for research
- get to know the systematic way of interpreting results
- acquire knowledge on report writing and paper publication

Unit 1: Research Methodology **10 hrs**

Meaning, Basic and applied research, Essential steps in research, Defining the research problem, Research/Experimental design, Research and Scientific Methods; Literature collection, Significance of research.

Unit 2: Interpretation and Report Writing **10 hrs**

Meaning of interpretation; Techniques of interpretation; Precautions in Interpretation; Synopsis/ Dissertation/Thesis/Report/Abstract/Manuscript/Review/Project/writing: Meaning, concept, objectives and scope, components, format, types, layout, different steps involved, Significance and Bibliography

Unit 3: Publications and Statistical Analysis **10 hrs**

Publishing research articles in Journals, Books, Proceedings. Citation Index, Impact factor, Abstract Index, Oral and Poster presentation. Statistical Methods: Collection and presentation of Data (Tables, Graphs, Diagrams). Standard deviation and standard error.

References:

Kumar K. L.' (1997), *Educational Technology*, New Age International (P) Ltd., New Delhi.

Kothari, C.R; II ed. (2004), *Research Methodology*, Methods and techniques; New Age Internartional (p) Ltd., Publishers, New Delhi.

Jerrald H. Zar (1999), *Biostatistical analysis of Prentice Hall International*, Inc. Press, London

Tony Bates A.W. Technology, (2005), *e-Learning and Distance Education*, New York, Routledge.

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VLSC15001: NUTRITION AND DIETETICS

Hours: 30

Course Objectives:

- Understand the nutritive value of different foods.
- Familarise the requirements, sources, deficiency and effects.
- Understand Food preservation and adulteration.

Course Outcomes:

After successful completion of the course, the student will be able to:

- Gain basic knowledge of the different nutrients.
- Get insight into the role of nutrients in maintaining health of the individual and community.
- Understand the interrelationship of the various nutrients.

Unit 1: Carbohydrate and Dietary fibre **8 hrs**

Recommended dietary allowances –Definition, General principles of deriving RDA, Factors affecting RDA, uses of RDA. Carbohydrates –Definition, Nutritional classification, Functions, Requirements and Sources, Regulation of Blood Sugar level. Dietary Fibre –Definition, Classification, Role of Fibre in Preventing disease and sources.

Unit 2: Proteins, Lipids and Minerals **8 hrs**

Proteins-Definition, Composition, Nutritional classification of protein and amino acids, Functions of Proteins and amino acids, Sources and Requirements, Deficiency; Evaluation of Protein quality-PER, BV, NPU and chemical score. Lipids –Definition, Composition, Nutritional classification, Functions, Sources and requirements; Essential fatty acids –Definition, Functions, Sources and effects of deficiency. Minerals –Classification and General Functions. Macro minerals, Functions, Requirements, Sources, Effects of Deficiency, Micro Minerals, Functions, Requirements, Sources and Effect of Deficiency.

Unit 3: Nutritive value of Foods **7 hrs**

Energy-Definitions, Energy units, Determination of energy value of foods by direct and indirect calorimetry and physiological Energy Value of foods. BMR –Definitions, Determinations, Factors affecting the BMR; Energy requirements for physical activity –Factorial method, Energy requirement and sources.

Unit 4: Food Preservation **7 hrs**

Vitamins-Deficiency, Classification and General Functions. Fat Soluble Vitamins –Vitamin A, D, E and K- Functions, Requirements, Sources and Effect of deficiency. Water soluble vitamins -Thiamine, Riboflavin, Niacin, Ascorbic acid, Folic acid, Vitamin B_6 and B_{12} Functions, Requirements, Sources and Effects of deficiency.

References:

Swaminathan, M., *Essentials of food and Nutrition*, Vol I & II, Bappco Publishers, Madras 2000.

Srilakshmi. B., *Nutrition Science*, New Age International (P) Ltd, Publishers, 2004.

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